

We claim:

1. A method for preoperative planning and simulating of orthopedic surgical procedures using medical images, comprising *inter alia* the steps of the following:
 - a. obtaining and displaying said medical images;
 - b. segmenting anatomical structure into segments in said medical images; and
 - c. planning the result of said orthopedic surgical procedure so output images are produced,
 wherein the obtained output images comprising features selected from the group of a plurality of calibrated organs; a plurality of organ segments; a plurality of calibrated artificial elements; and/or at least one superposition of said calibrated artificial elements on said calibrated organs and/or organ segments.
2. The method according to claim 1, further comprising dynamic rendering of medical device form pre defined members, the method allowing dynamic rendering of medical devices with a pre defined relationship, wherein two or more members can be integrated to one member in runtime according to a predefined rule.
3. The method according to claim 1, wherein said medical images are X-ray images.
4. The method according to claim 1, wherein said medical images are combination of plurality of imaging techniques.
5. The method according to claim 1, wherein said medical images comprising a plurality of views of said anatomical structure.
6. The method according to claim 1, wherein the obtaining step comprising transforming of said medical images to digital images.

7. The method according to claim 1, wherein said obtaining includes composing of several images of the same anatomical structure into a full-length view of said anatomical structure.
- 5 8. The method according to claim 1, wherein the obtaining step comprising calibrating of images.
9. The method according to claim 6, wherein said calibrating comprising registration of different views.
- 10 10. The method according to claim 6, wherein said calibrating comprising dimension and orientation calibration.
11. The method according to claim 6, wherein said calibrating comprising image
15 enhancements comprising brightness and contrast adjustments, and edge detection.
12. The method according to claim 1, wherein the segmenting step is performed manually by a medical expert, or automatically, in the manner that the
20 anatomical structure segments are segmented according to predefined rules, or semi-automatically, in the manner that the segmenting step is performed automatically with the assistance of a medical expert.
13. The method according to claim 1, wherein the planning step comprising
25 simulating different positioning of said anatomical structure segments.
14. The method according to claim 14, wherein said different positioning of said anatomical structure segments relates to reducing of fractures during trauma treatment.
- 30 15. The method according to claim 14, wherein said different positioning of said anatomical structure segments relates to pre designed osteotomy treatments for deformed anatomical structures.

16. The method according to claim 1, wherein said artificial elements comprising implants, in the manner that superposition of implants and said segmented anatomical structure over non-segmented fragments of said anatomical structure is provided.
- 5 17. The method according to claim 1, wherein said artificial elements comprise fixation elements, in the manner that superposition of members selected from fixators, fixators anchoring devices, and said segmented anatomical structure over non-segmented fragments of said anatomical structure is provided.
- 10 18. The method according to claim 18, further comprising a step of choosing a plurality of said fixation elements from a predefined database.
- 15 19. The method according to claim 18, further comprising rules for correct positioning of said fixation elements so incorrect positioning of said fixation elements is prevented.
- 20 20. The method according to claim 1, additionally comprising a step of producing and storing output images and planning reports of a plurality of alternatives of said steps of segmenting and planning, for the purpose that the best alternative for medical treatment is selected from said alternatives; said planning report comprising part definition of said artificial elements selected for the treatment as well as patient information.
- 25 21. The method according to claim 20, additionally comprising a step of providing hard copies of said output images and said planning reports of a selected set of said alternatives.
- 30 22. The method according to claim 20, additionally comprising a step of communicating said output images and said planning reports to a plurality of remote users.
23. An apparatus for pre planning and simulating of orthopedic surgical procedures using medical images comprising;

- a. segmenting means for defining and marking anatomical structure segments in said medical images;
 - b. planning means for planning the result of said orthopedic surgical procedure, comprising means for producing output images; wherein said output images comprising features selected from the group of a plurality of calibrated organs; a plurality of organ segments; a plurality of calibrated artificial elements; and/or at least one superposition of said calibrated artificial elements on said calibrated organs and/or organ segments;
 - c. a memory for storing said medical images and said desired result; and,
 - d. a display for displaying said medical images and said output images;
24. The method according to claim 1, further comprising means for dynamic rendering of medical device form pre defined members, allowing dynamic rendering of medical devices with a pre defined relationship, wherein two or more members can be integrated to one member in runtime according to a predefined rule.
25. The apparatus according to claim 24, wherein the medical images are X-ray images.
26. The apparatus according to claim 24, wherein the medical images are combination of a plurality of imaging techniques.
27. The apparatus according to claim 24, wherein the medical images comprising a plurality of views of the same anatomical structures.
28. The apparatus according to claim 24, additionally comprising means for transforming said medical images to digital images.
29. The apparatus according to claim 1, additionally comprising means for composing of several images of the same anatomical structure into a full-length view of said anatomical structure.

30. The apparatus according to claim 24, additionally comprising calibration means for images.
31. The apparatus according to claim 29, wherein the calibration means are also
5 utilized for registration of different views.
32. The apparatus according to claim 29, wherein the calibration means are also utilized for dimension and orientation calibration.
- 10 33. The apparatus according to claim 29, wherein the calibration means are also utilized for image enhancements comprising brightness and contrast adjustments, and edge detection.
34. The apparatus according to claim 29, wherein the calibration means are also
15 utilized for correction of image distortions
35. The apparatus according to claim 24, wherein the segmenting means are manually operated by a medical expert, or wherein the segmenting means are automatically operated according to predefined rules, or wherein the segmenting
20 means are operated semi-automatically in the manner that the segmenting step is performed automatically with the assistance of a medical expert.
36. The apparatus according to claim 24, wherein the planning means are additionally utilized for simulating different positioning of said anatomical
25 structure segments.
37. The apparatus according to claim 36, wherein the planning means are utilized for simulating reduction of fractures during trauma treatment.
- 30 38. The apparatus according to claim 36, wherein said different positioning of said anatomical structure segments relates to pre designed osteotomy treatments for deformed anatomical structures.

39. The apparatus according to claim 24, wherein the artificial elements comprise implants, in the manner that superposition of implants and said segmented anatomical structure over non-segmented fragments of said anatomical structure is provided.
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40. The apparatus according to claim 24, wherein the artificial elements comprising fixation elements, in the manner that superposition of members selected from fixators, fixators anchoring devices, and said segmented anatomical structure over non-segmented fragments of said anatomical structure is provided.
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41. The apparatus according to claim 40, further comprising a predefined database comprising predefined sets of fixation elements.
42. The apparatus according to claim 40, further comprising means for correct positioning of said fixation elements so incorrect positioning of said fixation elements is prevented.
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43. The apparatus according to claim 24, additionally comprising a means for producing and storing output images and planning reports of plurality of alternatives, for the purpose that the best alternative for medical treatment is selected from said alternatives, said planning reports comprising part definition of said artificial elements selected for the medical treatment and patient information.
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44. The apparatus according to claim 43, additionally comprising means for creating hard copies of said output images and said planning reports of a selected set of said alternatives.
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45. The apparatus according to claim 43, additionally comprising communicating means for communicating said output images and said planning reports to remote users.
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